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**A1**

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## EUROPEAN PATENT APPLICATION

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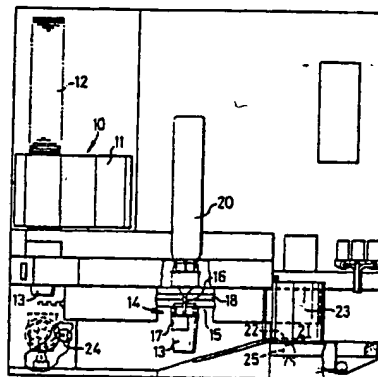
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⑤④ Improvements in and relating to vending machines.

⑤⑦ The present invention relates to a vending machine of the kind described for use in combination with a disposable cup (13) having a generally reflective outer surface, said machine including at least one radiation transmitter and sensor (24, 25, 26), so arranged that the sensor is adapted to receive radiation reflected from the external surface of the cup within the machine, the arrangement being such that if no positive indication of cup presence is received in the correct control sequence of the control means then the control means is disabled to prevent further function of the machine until the deficiency has been rectified.



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DESCRIPTION

The present invention relates to vending machines and has particular reference to a vending machine of the kind comprising a cup magazine, a cup dispensing station remote from said cup magazine, cup transport  
5 means for transporting a cup along a cup path from said magazine to said dispensing station and control means for controlling a supply of cups from a magazine and for controlling said transport means, hereinafter referred to as "of the kind described".

10 In machines of this type, it is essential to provide a periodic indication as to the position of a cup prior to proceeding with, for example, a dispensing operation. In the event of a cup not being present in the dispense operation, then the  
15 dispense operation could proceed in the absence of a cup thereby injecting ingredients into the body of the machine itself with the attendant mess involved.

In order to avoid this, it has been the practice  
20 of vending machine manufacturers to position a micro-switch at various positions along the cup path to ensure the correct positioning of a cup prior to initiation of the dispense operation. In this way unwanted dispense operations whether of solid  
25 ingredients or of makeup liquid such, for example, as water have been avoided.

The disadvantage of microswitches, however, is that their life is dependant upon a number of times in which the device is used.

Thus a microswitch controlled device with  
5 intensive use may last a comparatively short period  
whereas one with only occasional use will last  
for a much longer period. Vending machines are  
employed in a variety of environments some of  
which are intensively used and others which are  
10 only occasionally used.

According to the present invention, there is  
provided a vending machine of the kind described  
for use in combination with a disposable cup having  
a generally reflective outer surface said machine  
15 including at least one radiation transmitter and  
sensor whereby the sensor is adapted to receive  
radiation reflected from the external surface of  
the cup within the machine, the arrangement being  
such that if no positive indication of cup presence  
20 is received in the correct control sequence of the  
control means then the control means is disabled  
to prevent further function of the machine until  
the deficiency has been rectified.

In a particular embodiment of the present invention  
25 there is provided a vending machine of the kind described  
including at least one cup sense means disposed along

said cup path, said cup sense means comprising a transmitter adapted to direct electromagnetic radiation towards a cup location and a receiver adapted to receive radiation reflected from a cup located at said location said receiver being operatively connected with the control means so that when the transmitter is operated without radiation being detected by said receiver the control means is disenabled.

10 In a particular embodiment of the present invention the cup magazine may comprise a cup turret with associated cup dropper adapted to receive a stack of cups and dispense a cup into a cup carriage. The cup sense means in accordance with the present invention may be disposed juxtaposed the cup carriage to detect the presence or absence of a cup in the carriage prior to the commencement of a dispense operation.

20 In a further embodiment of the present invention, a cup sense means may also be provided juxtaposed the cup dispensing station to sense the presence of a cup whereby in the event of a positive indication a control means is disenabled to the extent of preventing the commencement of a dispense cycle of the machine while the cup remains in position.

25 In another embodiment of the present invention the vending machine includes an access door at the cup

dispensing station, means for locking the door in a closed position in the absence of a cup, and sense means juxtaposed said cup position at the dispense station arranged to sense the presence of a cup  
5 to enable or disenable the door locking means accordingly.

In a preferred embodiment of the present invention the radiation transmitter and the radiation receiver may be located in one sense head juxtaposed the cup  
10 position to be sensed.

Following is a description by way of example only and with reference to the accompanying drawings of methods of carrying the invention into effect.

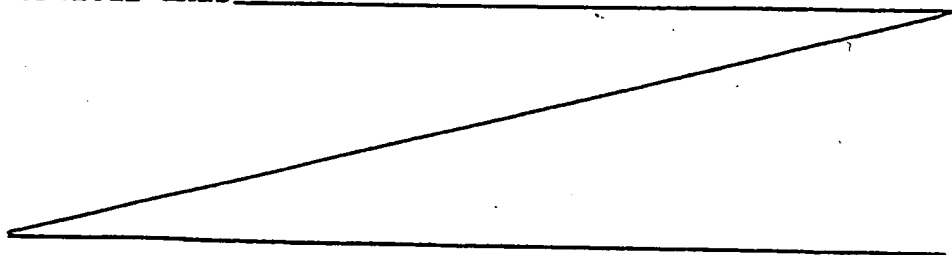
In the drawings:-

15 Figures 1(a) and 1(b) are diagrams partly in section, of parts of a dispensing machine in accordance with the present invention.

Figure 2 is a detail of the control circuitry of the sense heads employed in accordance with the  
20 invention.

Figure 3 is a rear view of the machine of Figure 1.

Turning now to the apparatus of Figure 1, a cup magazine 10 comprises a turret 11 rotatable about a vertical axis



and having a plurality of locations each capable of accommodating a stack 12 of cups, lowermost a cup 13 of which is disposed in a cup dropper of known configuration. Juxtaposed the cup dropper, 5 there is provided a cup conveyor 14 comprising a track 15 and a carriage 16 having a cup receiving arm 17. The carriage 16 is moved by a conveyor tape 18 driven by motor means (not shown) and controlled by a micro-processor control means. The 10 conveyor tape 18 is arranged to transport carriage 16 along track 15 passed a plurality of ingredient dispense positions 20. At the end of the cup path defined by the conveyor track, there is provided a cup dispensing station 21 at which the cup 13 is 15 disengaged from arm 17 to be presented on a base 22 for collection by consumer. The dispense station 21 is protected by means of an access door 23 which is moved between an open position in which access can be gained to the cup in a closed position in which the 20 cup at the dispensing station 21 is isolated from the surroundings. The door 23 is controlled by means of a solenoid lock (not shown) operatively inter-connective with the microprocessor control means.

Juxtaposed the datum position of cup arm 17 beneath the cup dropper, there is provided a sense head 24 comprising an infrared transmitter and an infrared receiver. The cup stack 12 is formed of 5 cups each having a substantially reflective outer surface such, for example, as white plastic. A similar sense head 25 is provided in the dispense station beneath base 22. A further sense head 26 may be juxtaposed by the cup stack juxtaposed 10 the cup dropper.

Each of the sense heads 24, 25 and 26 may be operatively connected with the microprocessor so that on sensing the present or absence of the cup as is appropriate the controlled means for the conveyor 15 is disenabled to prevent further operation by the machine until the fault is remedied.

The sensing circuit is disclosed in figure 2 and comprises an emitter 30 and a photoelectric cell 31 the photoelectirc cell being connected by a trigger 32 20 so that when radiation is received by cell 31 trigger 32 is red operative to render trigger output 33 high to give a positive indication when the object is present.

The detector 26 used in the cup turret system is such that when the level of cups fulls below the sensor 25 the drive motor of the turret will be caused to operate until cups from other tubes fill the dispensing stack



to a level such that the sensor stops the motor  
when the receiver or photo cell detects reflected  
radiation. The microprocessor provides a time over  
ride control to ensure that the turret 11 completes at  
5 least one rotation before indicating "cups sold out"  
and inhibiting the next vend until the turret has been  
at least partly replenished.

It will be appreciated that devices employed in  
accordance with the applicants present invention  
10 constitutes a direct replacement for microswitches which  
require their levers to be in physical contact with  
the cup edges or other components. The sensors in  
accordance with the present invention require no  
physical contact with the object, i.e. the cup,  
15 and do not, therefore, contribute to feed jams in  
the cup supply system.

CLAIMS:-

1. A vending machine of the kind described for use in combination with a disposable cup having a generally reflective outer surface, said machine including at least one radiation transmitter and sensor, so arranged that the sensor is adapted to receive radiation reflected from the external surface of the cup within the machine, the arrangement being such that if no positive indication of cup presence is received in the correct control sequence of the control means then the control means is disabled to prevent further function of the machine until the deficiency has been rectified.
2. A vending machine of the kind described including at least one cup sense means disposed along said cup path, said cup sense means comprising a transmitter adapted to direct electromagnetic radiation towards a cup location and a receiver adapted to receive radiation reflected from a cup located at said location, said receiver being operatively connected with the control means so that when the transmitter is operated without radiation being detected by said receiver the control means is disabled.
3. A vending machine as claimed in claim 1 or claim 2 wherein the cup magazine comprises a cup turret with associated cup dropper adapted to receive a stack of

cups and dispense a cup into a cup carriage.

4. A vending machine as claimed in claim 2 wherein the cup sense means is disposed juxtaposed the cup carriage to detect the presence or absence of a cup in the carriage prior to the commencement of a dispense operation.

5. A vending machine as claimed in claim 2 wherein a cup sense means is also provided juxtaposed the cup dispensing station to sense the present of a cup whereby in the event of a positive indication a control means is disenabled to the extent of preventing the commencement of a dispense cycle of the machine while the cup remains in position.

6. A vending machine as claimed in claim 1 or claim 2 including an access door at the cup dispensing station, means for locking the door in a closed position in the absence of a cup, and sense means juxtaposed said cup position at the dispense station arranged to sense the presence of a cup to enable or disenable the door locking means accordingly.

7. A vending machine as claimed in claim 2 wherein the radiation transmitter and the radiation receiver are located in one sense head juxtaposed the cup position to be sensed.

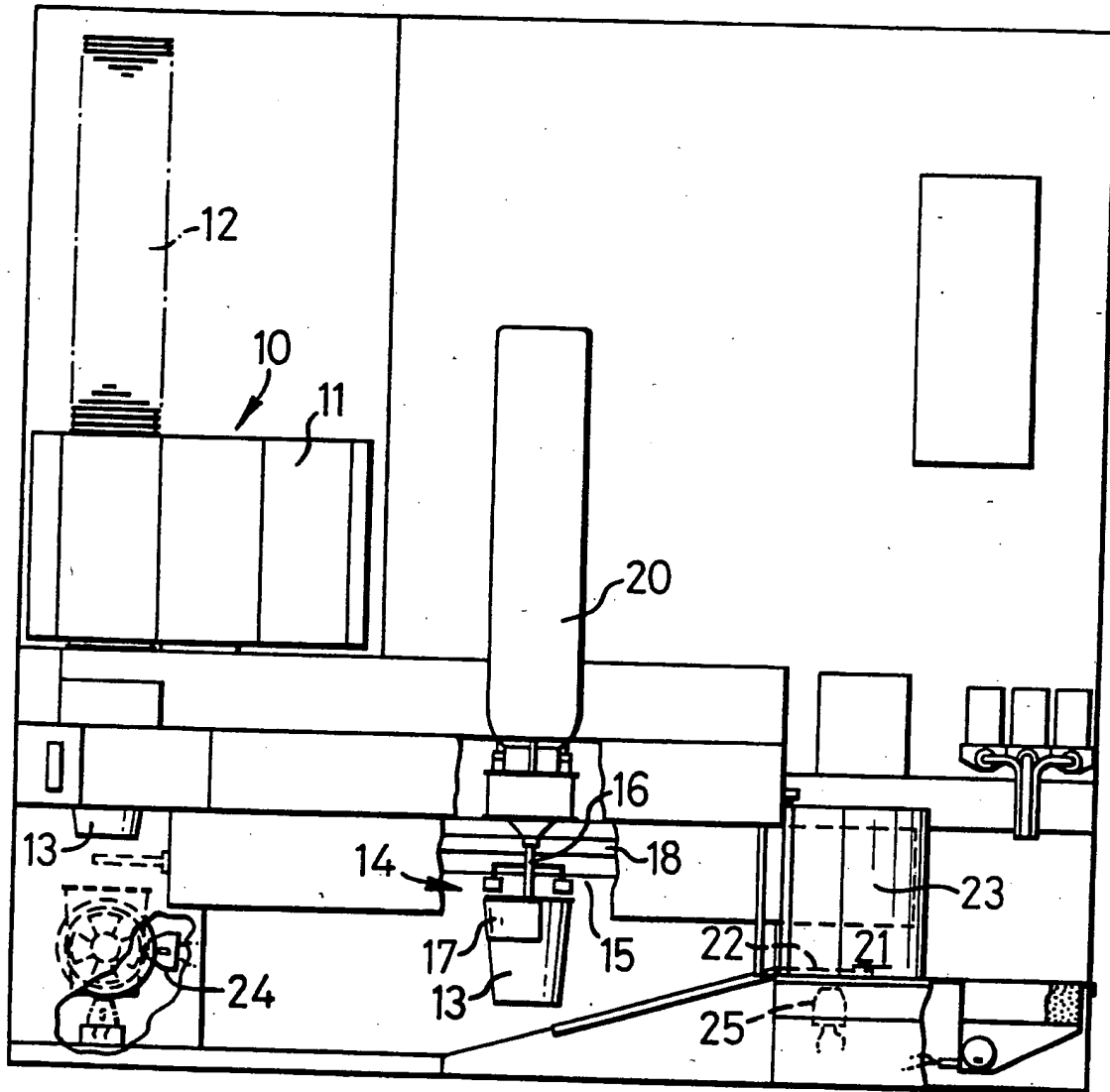
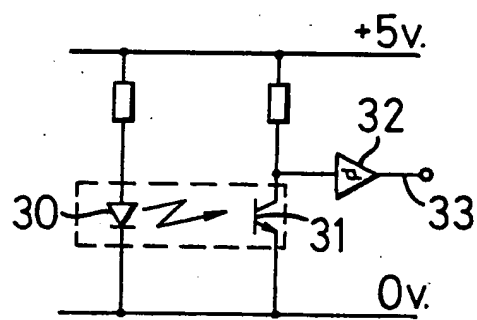
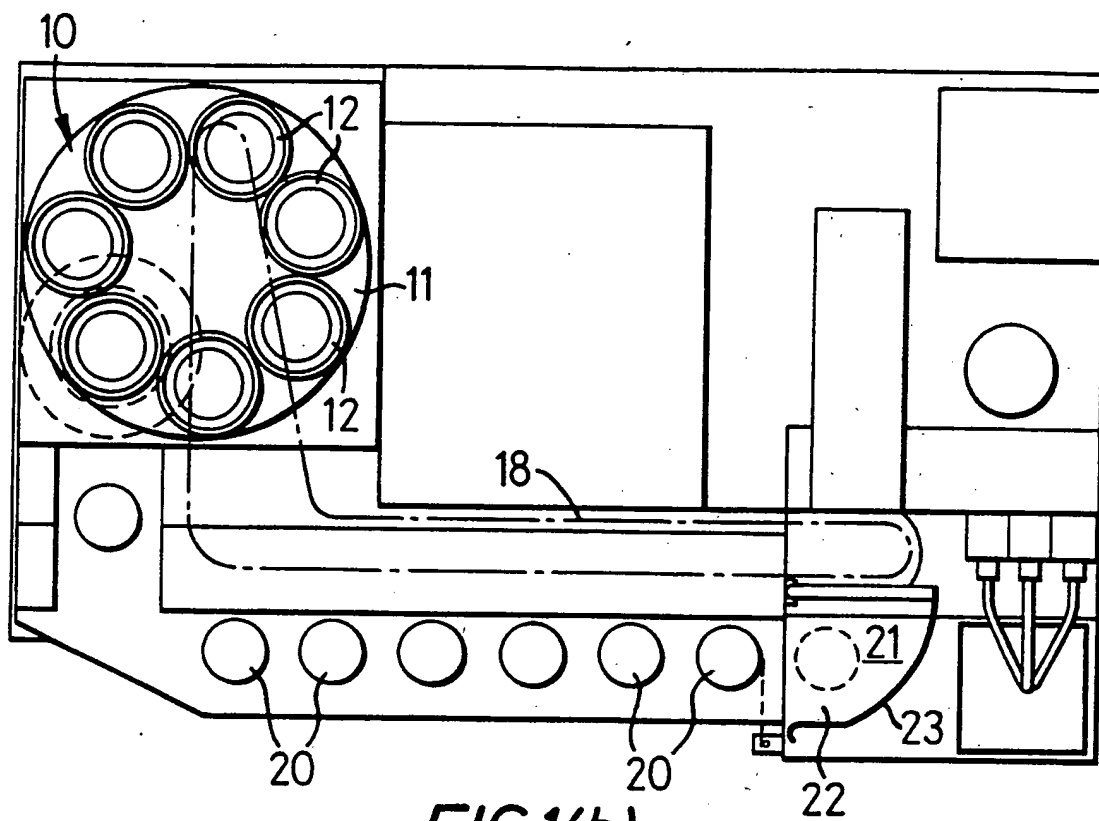
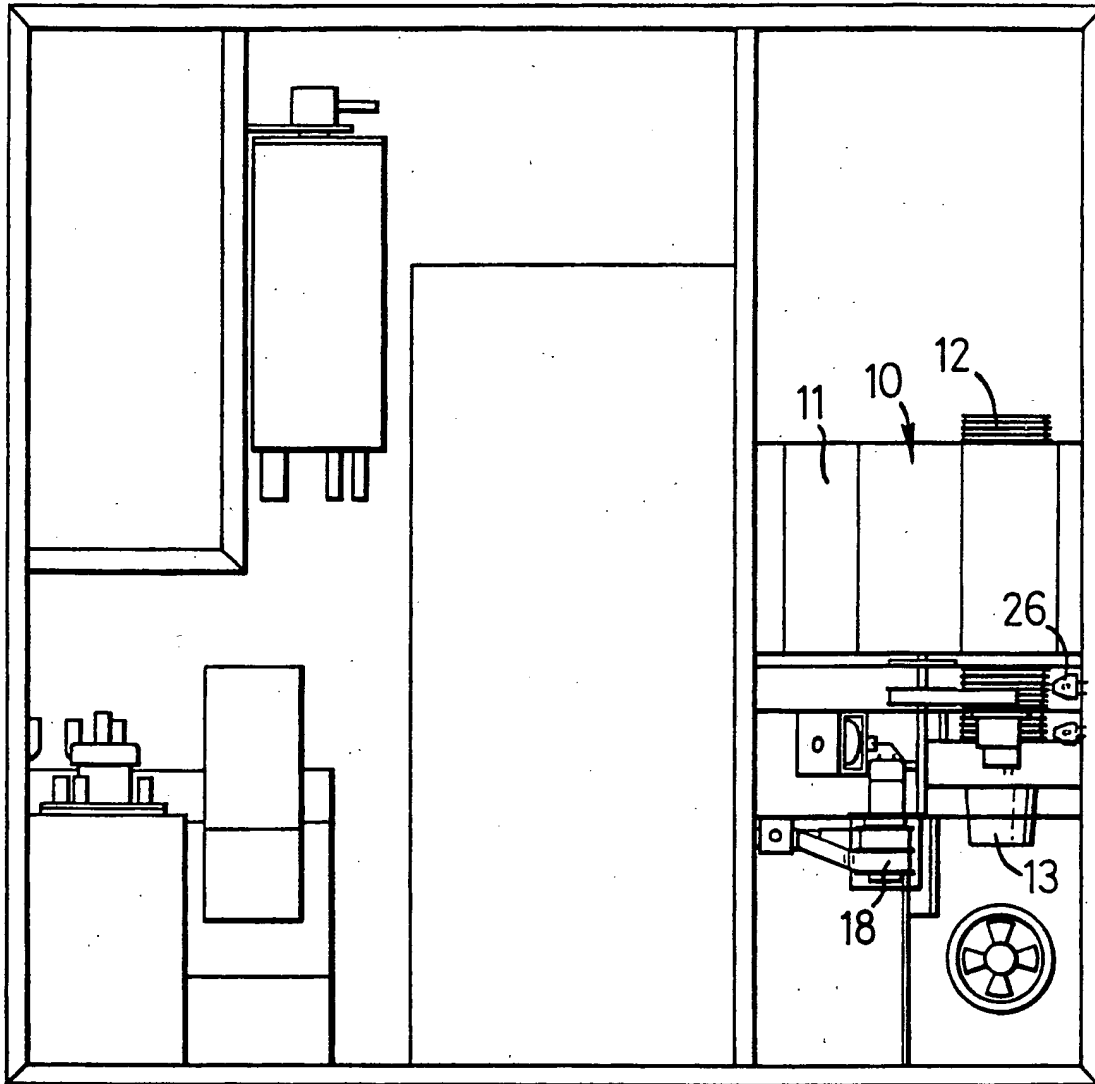


FIG. 1(a)



*FIG. 3*



European Patent  
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# EUROPEAN SEARCH REPORT

0053489

Application number

EP 81 30 5602

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US - A - 3 461 922 (W. NIEHAUS) * Column 2, lines 5-10, 26-30; column 3, line 1 - column 4, line 52; figures 1-5 *	1-3	G 07 F 13/10
A	US - A - 3 103 960 (L.G. SIMJIAN) * Column 4, line 43 - column 5, line 2; figures 9, 10 *	1,2,4	
A	DE - A - 2 724 721 (J. ZWANENBURG) * Page 9, lines 22-28; figure 1 * & GB - A - 1 586 858	1,5	TECHNICAL FIELDS SEARCHED (Int.Cl. 3)
A	US - A - 3 357 133 (K.J. HELSING) * Column 2, line 56 - column 3, line 11; figures 1,2,6 *	1,6	G 07 F 13/00 13/06 13/10
A	US - A - 4 202 387 (D.J. UPTON) * Column 3, line 55 - column 4, line 19; figure 1 *	1,7	
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20-01-1982	Examiner RUDOLPH